NOAA SCIENTIFIC PUBLICATIONS REPORT
JUNE 9, 2014

HIGHLIGHTED ARTICLES

A spatially distinct history of the development of California groundfish fisheries

Seasonal distribution and historic trends in abundance of white sharks, *Carcharodon carcharias*, in the western North Atlantic ocean

The influence of forage fish abundance on the aggregation of Gulf of Maine Atlantic cod (*Gadus morhua*) and their catchability in the fishery

Pollution, habitat loss, fishing and climate change as critical threats to penguins

Evidence of Atlantic sturgeon (*Acipenser oxyrinchus*) spawning in the York River system

Increased cellular brevetoxins in the red tide dinoflagellate *Karenia brevis* under CO_2 limitation of growth rate: evolutionary implications and potential impacts on bloom toxicity



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ADDITIONAL ARTICLES

Post-settlement survivorship in two Caribbean broadcasting corals

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Description of a new cryptic, shallow-water tonguefish (Pleuronectiformes: Cynoglossidae: *Symphurus*) from the western North Pacific

Negative indirect effects of neighbors on imperiled scleractinian corals

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Beach disposal of fine sediments leads to losses of invertebrate prey



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A spatially distinct history of the development of California groundfish fisheries

PLoS One

R. R. Miller, J. C. Field, J. A. Santora, I. D. Schroeder, D. D. Huff, Meisha Key**, D. E. Pearson,** and **A. D. MacCall (NMFS/SWFSC)**

- Authors used a newly reconstructed catch dataset available for California fisheries and found that over the history of these fisheries, catches occurred in increasingly deeper habitat, at a greater distance from ports, and in increasingly inclement weather conditions, accounting for shifts in species composition that were expected as fisheries moved into deeper, more offshore waters.
- This unique dataset and analysis provides a comprehensive appreciation for the development of groundfish fisheries with respect to commonly assumed trends of global fisheries patterns that are typically constrained by a lack of long-term spatial datasets.
- This research will benefit stock assessments, marine spatial planning, habitat impact assessments, and quantification of ecosystem services.

Understanding how fisheries have developed in space and time is critical for interpreting and managing the response of ecosystems to the effects of fishing, however time series of spatially explicit data are typically rare. Due to the recent recovery and digitization of California's 1933-1968 commercial catch dataset, the full historical data series for both commercial and recreational fishing in the state from 1933-2010 is available. This unique dataset includes landing estimates at a coarse 10 by 10 minute "grid-block" spatial resolution and extend the entire length of coastal California up to 180 kilometers from shore. Authors focused on the catch history of groundfish that were mapped for each grid-block using the year at 50% cumulative catch and total historical catch per habitat area. They constructed generalized linear models to quantify the relationship between spatiotemporal trends in groundfish catches, distance from ports, depth, percentage of days with wind speed over 15 knots, sea surface temperature, and ocean productivity. The results indicate that over the history of these fisheries, catches occurred in increasingly deeper habitat, at a greater distance from ports, and in increasingly inclement weather conditions, accounting for shifts in species composition that were expected as fisheries moved into deeper, more offshore waters. Understanding spatial development of groundfish fisheries and catches in California are critical for improving population models and for evaluating whether implicit stock assessment model assumptions of relative homogeneity of fisheries removals over time and space are reasonable.

Expected Publication Date: Summer 2014



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Seasonal distribution and historic trends in abundance of white sharks, Carcharodon carcharias, *in the western North Atlantic Ocean*
PLoS One
T. H. Curtis (NMFS/GARFO), **C. T. McCandless (NMFS/NEFSC)**, **J. K. Carlson (NMFS/SEFSC)**, G.B. Skomal, **N. E. Kohler (NMFS/NEFSC)**, **L. J. Natanson (NMFS/NEFSC),** G.H. Burgess, **J. J. Hoey (NMFS/NEFSC)**, and H. L. Pratt, Jr.

- This study represents the most comprehensive synthesis of data on Northwest Atlantic white sharks to date, and significantly updates previous reviews.
- Northwest Atlantic white sharks exhibit a seasonal north-south distribution shift that is likely driven by a combination of environmental preferences and prey availability. These sharks appear to migrate along the Atlantic coast rather than regularly moving into offshore pelagic waters, as they do in the eastern North Pacific; although, preliminary satellite tracking data suggest that some individuals also spend time beyond the continental shelf.
- Consistent with past analyses, significant declines in the Northwest Atlantic white shark population through the 70s and 80s were identified, but previously undocumented positive trends were present in multiple time series since the 1990s. These population changes are in agreement with our understanding of the expansion and eventual regulation of shark fisheries during these time frames.

Despite recent advances in field research on white sharks (*Carcharodon carcharias*) in several regions around the world, opportunistic capture and sighting records remain the primary source of information on this species in the northwest Atlantic Ocean (NWA). Previous studies using limited datasets have suggested a precipitous decline in the abundance of white sharks from this region, but considerable uncertainty in these studies warrants additional investigation. This study builds upon previously published data combined with recent unpublished records and presents a synthesis of 649 confirmed white shark records from the NWA compiled over a 210-year period (1800-2010), resulting in the largest white shark dataset yet compiled from this region. These comprehensive records were used to update our understanding of their seasonal distribution, relative abundance trends, habitat use, and fisheries interactions. All life stages were present in continental shelf waters year-round, but median latitude of white shark occurrence varied seasonally. White sharks primarily occurred between Massachusetts and New Jersey during summer and off Florida during winter, with broad distribution along the coast during spring and fall. The majority of fishing gear interactions occurred with rod and reel, longline, and gillnet gears. Historic abundance trends from multiple sources support a



significant decline in white shark abundance in the 1970s and 1980s, but there have been apparent increases in abundance since the 1990s when a variety of conservation measures were implemented. Though the white shark's inherent vulnerability to exploitation warrants continued protections, our results suggest a more optimistic outlook for the recovery of this iconic predator in the Atlantic.
Expected Publication Date: June 2014

*The influence of forage fish abundance on the aggregation of Gulf of Maine Atlantic cod (*Gadus morhua*) and their catchability in the fishery*
Canadian Journal of Fisheries and Aquatic Sciences
D. E. Richardson, M. Palmer, and **B. Smith (NMFS/NEFSC)**

- This paper addressed why the fishery perceived Gulf of Maine cod to be abundant leading up to the 2011 stock assessment, whereas the assessment results showed little stock rebuilding.
- A prey shift by Atlantic cod from Atlantic herring to sand lance is hypothesized to have driven cod to concentrate on Stellwagen Bank where easily caught by the fishery.
- The major implication for the stock assessment of Atlantic cod is that fisheries catch per unit effort is not a valid indicator of cod abundance.

Shifts in the distribution and aggregation patterns of exploited fish populations can affect the behavior and success of fishermen, and can complicate the interpretation of fisheries-dependent data. Starting in 2006, coinciding with an increase in sand lance (*Ammodytes* spp.) abundance, Gulf of Maine Atlantic cod (*Gadus morhua*) concentrated on Stellwagen Bank, a small (405 km^2) underwater plateau located in the southwestern portion of the larger (52,461 km^2) stock area. The cod fishery in turn concentrated on Stellwagen Bank. Specifically, the proportion of Gulf of Maine cod landings caught in a single 10-minute square area (260 km^2) encompassing the tip of Stellwagen Bank increased from 12% in 2005 to 45% in 2010. An increase in landings-per-unit-effort in the fishery coincided with the concentration of the fleet on Stellwagen Bank. Overall, both fisheries-independent and dependent data indicate that an increase in sand lance abundance resulted in cod aggregating in a small and predictable area where they were easily caught by the fishery. More broadly, this work illustrates how changes in the distribution patterns of fish and fisherman can decouple trends in abundance and fisheries catch-per-unit-effort.
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NOAA SCIENTIFIC PUBLICATIONS REPORT
JUNE 9, 2014

Pollution, habitat loss, fishing and climate change as critical threats to penguins
Conservation Biology
P. N. Trathan, P. García-Borboroglu, D. Boersma, C-A. Bost, R. J. M. Crawford, G. T. Crossin, R. J. Cuthbert, P. Dann, L. S. Davis, S. De la Puente, H. J. Lynch, T. Mattern, K. Pütz, P. J. Seddon, **W. Trivelpiece (SWFSC/AERD)**, and B. Wienecke

- Habitat loss, pollution, and fishing, all factors humans can readily mitigate, remain the primary threats for penguin species. Their future resilience to further climate change impacts will almost certainly depend on addressing current threats to existing habitat degradation on land and at sea.
- Protection of breeding habitat, linked to the designation of marine reserves, including in the High Seas, will be critical for the future conservation of penguins.

Cumulative human impacts across the world's oceans are considerable. Authors therefore examined a single model taxonomic group, the penguins (Spheniscidae), to explore how marine species and communities might be at risk of decline or extinction in the southern hemisphere. Authors sought to determine the most important threats to penguins and to suggest means to mitigate these threats. Their review has relevance to other taxonomic groups in the southern hemisphere and in northern latitudes where human impacts are greater. The review was based on an expert assessment and literature review of all 18 penguin species; 49 scientists contributed to the process. For each penguin species, authors considered their range and distribution, population trends, and main anthropogenic threats over the past approximately 250 years. These threats were: harvesting adults for oil, skin, and feathers and as bait for crab and rock lobster fisheries; harvesting of eggs; terrestrial habitat degradation; marine pollution; fisheries bycatch and resource competition; environmental variability and climate change; and toxic algal poisoning and disease. Habitat loss, pollution, and fishing, all factors humans can readily mitigate, remain the primary threats for penguin species. Their future resilience to further climate change impacts will almost certainly depend on addressing current threats to existing habitat degradation on land and at sea. Authors suggest protection of breeding habitat, linked to the designation of appropriately scaled marine reserves, including in the High Seas, will be critical for the future conservation of penguins. However, large-scale conservation zones are not always practical or politically feasible and other ecosystem-based management methods that include spatial zoning, bycatch mitigation, and robust harvest control must be developed to maintain marine biodiversity and ensure ecosystem functioning is maintained across a variety of scales.

Accepted: 15 May 2014



NOAA SCIENTIFIC PUBLICATIONS REPORT
JUNE 9, 2014

*Evidence of Atlantic sturgeon (*Acipenser oxyrinchus*) spawning in the York River system*
Transactions of the American Fisheries Society
C. Hager, **J. Kahn (NMFS/OPR)**, C. Watterson, J. Russo, and K. Hartman

- This paper reports the discovery of a previously unidentified spawning population of endangered Atlantic sturgeon within the Chesapeake Bay's York River watershed.
- This work also confirms that Atlantic sturgeon in the York River watershed spawn in the fall, which is consistent with the nearby James River.
- These data may be important for conservation management of the Atlantic sturgeon, demonstrating that the Chesapeake Bay distinct population segment is comprised of at least two spawning populations.

The National Marine Fisheries Service listed five distinct population segments of Atlantic sturgeon as threatened and endangered under the Endangered Species Act on February 6, 2012. At that time, the only known spawning population of sturgeon in the Chesapeake Bay was in the James River. The goal of this research was to determine whether reproduction was also occurring in the Chesapeake's York River watershed. Based on the assumption that an early fall spawning event occurs in the upper reaches of the watershed, sampling occurred in late August of 2013 when water temperatures became appropriate for spawning. During a week of sampling, numerous male sturgeon running milt and one spawned out female with residual eggs still present were captured. The co-occurrence of reproductively active males and a recently spawned out female Atlantic sturgeon in the upper Pamunkey River at temperatures consistent with documented spawning temperatures in other systems indicates that fall spawning occurs in the York River system. Therefore, the Chesapeake Bay distinct population segment of Atlantic sturgeon has at least two spawning populations that managers should consider when protecting this listed species.
Accepted: 12 May 2014

Increased cellular brevetoxins in the red tide dinoflagellate Karenia brevis *under CO_2 limitation of growth rate: evolutionary implications and potential impacts on bloom toxicity*
Limnology and Oceanography
D. Ransom Hardison, William G. Sunda, Patricia, A. Tester, Damian Shea, and **R. Wayne Litaker (NOAA/NOS/NCCOS)**

- CO_2 limitation of *Karenia brevis* blooms result in more toxic cells. These cells are not as toxic as nitrogen or phosphate limited cells but significantly more toxic. This increase in brevetoxin is greater than nutrient sufficient cells. As ocean carbon dioxide increases in



the future, *Karenia brevis* blooms will be more toxic due both to higher density blooms and increased chance that cells will be N or P limited rather than CO_2 limited.

- The information provided will help coastal managers to better predict toxicity of blooms, information that helps managers and public health officials better manage the adverse consequences of Florida toxic red tides (>$25 million losses per year).
- The results are especially important to managers and public health officials along the Florida West Coast.

Karenia brevis blooms impair human health, marine ecosystems, and coastal economies in the Gulf of Mexico via their production of carbon-based neurotoxins (brevetoxins), which contain no nitrogen (N) or phosphorus (P). N and P limitation of growth rate substantially increases brevetoxins in this dinonagellate, consistent with predictions of the carbon nutrient balance (CNB) hypothesis. This hypothesis further predicts that an increase in carbon-based brevetoxins should not occur if growth rate is limited by carbon dioxide (CO_2). We tested this prediction by examining the effect of CO_2 limitation of *K. brevis* growth rate on cellular brevetoxins. In contradiction to the prediction of the CNB hypothesis, brevetoxins nonnalized to cell carbon were on average 81% higher in CO_2-limited cells growing at a rate of 0.1 d21 than in cells growing at their maximum rates (0.4-0.5/d):C values in the CO_2 -limited cells, however, was 23-42% lower than that previously observed for comparable growth rate limitation by phosphate. The CO_2 -limited cells also exhibited 40% higher cellular N:C and 60-100% higher chlorophyll a:C than observed in P-limited cells at equivalent growth rates. These effects were likely due to the up-regulation of the cell's CO_2 -concentrating mechanism under CO_2 limitation, which increased the demand for photosynthetically produced adenosine-5'-triphosphate. The results indicate that anthropogenic increases in CO*2* concentrations in surface ocean waters are likely to increase the toxicity of *K. brevis* blooms due to potential increases in bloom biomass yield and to a greater likelihood that dense blooms will become N or P limited rather than CO_2 limited.

Available Online: http://www.aslo.org/lo/toc/vol_59/issue_2/0560.pdf



NOAA SCIENTIFIC PUBLICATIONS REPORT
JUNE 9, 2014

ADDITIONAL ARTICLES

Post-settlement survivorship in two Caribbean broadcasting corals

Coral Reefs

M. W. Miller (NMFS/SEFSC)

- Results showed that even when early life history bottlenecks of broadcasting coral such as fertilization, advection, and settlement were overcome in a laboratory, survivorship of settlers in a reef environment was very low.
- The author found wide variation in success of cohorts and important differences in the larval recruitment capacities of *Orbicella faveolata* and *Acropora palmata,* two important reef-building species.
- These findings suggest that improvements in benthic habitat quality and/or further husbanding or grow-out are needed to foster successful seeding of reefs from cultured larvae.

The post-settlement phase of broadcast-spawned coral life histories is poorly known due to low detectability and, hence, presumed low abundance in the field. Authors used lab-cultured settled polyps of two important Caribbean reef-building species with negligible larval recruitment to quantify early post-settlement survivorship (6-9 weeks) over multiple years/cohorts and differing orientation on a reef in the Florida Keys. *Orbicella faveolata* showed significantly and consistently better survivorship in vertical rather than horizontal orientation, but overall no discernable growth. *Acropora palmata* showed no significant difference in survivorship between orientations, but significantly greater growth in the horizontal orientation. Both species showed significant variation in mean survivorship between cohorts of different years; 0-47% for *O. faveolata* and 12-49% for *A. palmata* over the observed duration. These results demonstrate wide variation in success of cohorts and important differences in the larval recruitment capacities of these two important and imperiled reef-building species.

Accepted: 20 May 2014

Passive acoustic monitoring of North Atlantic right whales on the calving grounds

Endangered Species Research

M. S. Soldevilla, A. R. Rice, C. W. Clark, and **L. P. Garrison (NMFS/SEFSC)**

- Passive acoustic monitoring methods successfully detected North Atlantic right whale calls at select sites on the right whales' Southeast United States calving grounds, with upcalls being the most frequently detected call type.



- While visual and acoustic survey methods had a similar probability of detecting whale presence per day, acoustic methods yielded greater temporal effort as they could be deployed continuously over 6 months, where visual effort was limited by weather and darkness.
- Passive acoustic monitoring is an effective method to augment detection of right whales on their calving grounds, especially at night when they cannot be seen, and it could be used as a tool to inform mariners of right whale presence and reduce the likelihood of ship strikes on calving grounds.

North Atlantic right whales calve during winter off Florida and Georgia, a region of high shipping traffic, and ship-strike risk is a concern. Passive acoustic monitoring of right whales on their foraging grounds increases detection opportunities to inform mariners of right whale presence and reduce the likelihood of ship strike. This study evaluates the effectiveness of passive acoustic monitoring on their calving grounds by documenting the occurrence of right whale call detections on two types of acoustic instruments and comparing results with visual sightings and ambient noise conditions. Over 400 right whale calling events were detected on archival MARUs at two sites across two seasons, and 92% of these calling events included right whale upcalls. Daily detections on archival MARUs and near-real time Autobuoys, which automatically detect upcalls, were significantly correlated and occurred on up to 25% of days off Savannah, Georgia and 46% of days off Jacksonville, Florida. Aerial surveys detected right whales within 20 km of each acoustic site on a similar proportion of days with visual survey effort (15-33% off Savannah and 34-43% off Jacksonville). Acoustic methods had greater temporal effort yielding a two- to ten-fold increase in days with right whale detections over visual methods. Shipping noise and fish chorusing likely mask right whale call detections. However, considering the high number of right whale calling event detections found during this study, the authors found that passive acoustic monitoring is an effective method to augment detection of right whales in this environment, especially at night when they cannot be seen.
Accepted: 26 March 2014

*Description of a new cryptic, shallow-water tonguefish (*Pleuronectiformes: Cynoglossidae: Symphurus) *from the western North Pacific*
Journal of Fish Biology
M. Lee, **T. A. Munroe (NMFS/NEFSC),** and K. Shao

- Authors describe the discovery of new species of cryptic, symphurine tonguefish from the western North Pacific Ocean using genetic techniques.



- This discovery increases knowledge about the biodiversity of Indo-West Pacific flatfishes and the distribution and diversity of a diminutive species of flatfishes.
- This research also helps to resolve a long-standing problem with the taxonomy of Pacific species of the cynoglossid genus *Symphurus* that are characterized by having 12 caudal-fin rays.

The authors combined results based on morphological characters and analyses of partial sequences of the *16S* rRNA and *COI* genes to confirm the validity of a new, cryptic, symphurine tonguefish from the western North Pacific Ocean. *Symphurus* n. sp., a diminutive species reaching sizes to ca. 67 mm L_S, is described from nine specimens that were collected at fish landing ports and from trawls made at ca. 150 m off Taiwan and Japan. *Symphurus*n. sp. shares many similar features with those of *S. microrhynchus* and that of several undescribed species that are morphologically similar to *S. microrhynchus*. *Symphurus* n. sp. has also been misidentified in fish collections as *S. orientalis* due to shared similarities in some aspects of their morphology. Despite overall similarities in morphology between *Symphurus*n. sp. and *S. orientalis*, as well as two of the nominal species morphologically similar to *S. microrhynchus*, analyses of partial sequences of the *16S* rRNA and *COI* genes reveal that *Symphurus* n. sp., *S. orientalis*, and these two other species represent three distinct lineages within the genus *Symphurus*.
Accepted: 7 May 2014

Negative indirect effects of neighbors on imperiled scleractinian corals
Coral Reefs
L. Johnston and **M. Miller (NMFS/SEFSC)**

- This study experimentally documents a strong asymmetrical prey preference for imperiled staghorn coral by the corallivorous snail.
- The resulting corallivore-mediated asymmetrical apparent competition is one mechanism impairing recovery in this ESA-listed species.
- This study demonstrates the potential density-dependence of corallivore impact on outplanted or restored staghorn populations and points toward recommendations for restocking/outplanting design to minimize this impact in areas where corallivore density is high.

Predation pressure on an organism or group may be influenced by spatial associations with other organisms. In the case of rare and imperiled species, such indirect interactions may affect the persistence and recovery of local populations. This study examined the effects of



coral neighborhood composition on the foraging behavior and impact of the corallivorous gastropod, *Coralliophila abbreviata*. We conducted a manipulative field experiment in which focal colonies of the threatened scleractinian coral *Acropora cervicornis* had no neighbors, conspecific neighbors, alternative prey (*Montastraea faveolata*) neighbors, or non-prey (*Porites asteroides*) neighbors. Individually tagged *C. abbreviata* were then seeded into the study area and allowed to colonize the experimental plots. Initial colonization was significantly affected by neighborhood treatment and was negatively correlated with focal colony growth. Snails exhibited a strong prey preference for *A. cervicornis* over *M. faveolata* and responded numerically to neighborhood quality (i.e.relative preference for neighboring corals). Thus, conspecific neighbors had the greatest predator-mediated negative effect on focal colony performance followed by *M. faveolata* neighbors. The results suggest that *C. abbreviata* mediate apparent competition between *M. faveolata* and *A. cervicornis* as both species contributed to the local abundance of their shared predator. Additionally, home range estimates for tagged *C. abbreviata* were calculated, compared among sexes, and found to be significantly greater for males than females. Overall, this study sheds light on the foraging behavior of an important coral predator and highlights the potential importance of consumer-mediated indirect interactions in the dynamics of severely reduced populations. The results also have direct implications for ongoing conservation and population enhancement efforts.
Accepted: 26 May 2014

Warm temperature streaks in the US temperature record: what are the chances?
Journal of Geophysical Research - Atmospheres
P. F. Craigmile, P. Guttorp, R. Lund, R. L. Smith, P. W. Thorne, and **D. Arndt (NESDIS/NCDC)**

- This paper puts forward several techniques for determining the likelihood of persistent warm (or cold) streaks or a particular length, given a time-series.
- Using its findings may be useful for answering questions about "how likely was this extended heat/cold?" and "was this streak more likely in a warming world?"
- This paper is largely statistical in nature and helps further refine practices commonly in use. However, its results may be contorted to claim that NOAA/NCDC overstated the rarity of the United States temperature streak of 2012.

A recent observation in NOAA's National Climatic Data Center's monthly assessment of the state of the climate was that contiguous US average monthly temperatures were in the top third



of monthly ranked historical temperatures for thirteen straight months from June 2011 to June 2012. The chance of such a streak occurring randomly was quoted as about one in 1.6 million. The streak continued for three more months before the October 2012 value dropped below the upper tercile. The real climate system displays a degree of persistence that serves to substantively increase this probability. This paper puts forth different statistical techniques that more accurately quantify the probability of this and other such streaks. We consider how much more likely streaks are when an underlying warming trend is accounted for in the record, the chance of streaks occurring anywhere in the record, and the distribution of the record's longest streak.
Published Online: 19 May 2014
http://onlinelibrary.wiley.com/doi/10.1002/2013JD021446/abstract

Beach disposal of fine sediments leads to losses of invertebrate prey
Marine Ecology Progress Series
L. M. Manning (NMFS/OPR), C. H. Peterson, and M. J. Bishop

- This study evaluates the impact of placement of dredged beach fill material on beach sediment sizes, invertebrate abundances, and foraging behavior of predatory fin fishes.
- The authors demonstrate through frequent sampling at fill disposal sites and control sites that invertebrate abundances are depressed for nearly a year following each annual disposal event.
- Mesocosm experiments suggest that turbidity plumes resulting from fill disposal slows clam growth and modifies habitat selection by predatory fin-fishes.
- The results have implications for shoreline erosion and management, beach nourishment, essential fish habitat, and more broadly for climate change related issues such as sea level rise.

Despite increased placement of beach fill with dredged materials to protect coastal property and public beach amenities from erosion, our understanding of the impact of fill placement on sandy beach ecosystems remains poor. The authors coupled field monitoring of two successive beach disposal events with manipulative mesocosm experiments to assess the mechanisms and extent of ecological impacts of fine sediment disposal on a beach in Topsail Island, North Carolina. Frequent sampling at replicate disposal and control sites revealed that following each annual beach disposal event, beach granulometry was transformed from medium to fine sands and turbidity plumes were generated in the surf zone that were more than 12 times higher than state water quality limits. Where disposal occurred before annual invertebrate recruitment, it caused



press responses to the mole crab *Emerita talpoida* (negatively impacted) and the spionid polychaete *Scolelepis squamata* (positively impacted). Where disposal followed recruitment, it acted as a pulse disturbance, presumably by burying and suffocating new recruits (*Donax variabilis* and haustoriid amphipods). Impacts to invertebrates lasted almost a year, such that across successive annual disposal events depression of invertebrate abundances was sustained, despite erosion within the year of the augmented sub-aerial sand mass. In mesocosm experiments, turbidity plumes of the magnitude experienced in the field slowed growth of clams and modified habitat choices by predatory fin-fishes. Hence, disposal of fine-grained dredge spoils on sandy beaches can negatively impact both invertebrate prey resources and predator foraging behavior, without augmenting the protective sub-aerial sand mass for more than one year.
Expected Publication Date: July 2014